Fourth Semester B.E. Degree Examination, June 2012
Microcontrollers

Time: 3 hrs.

Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1. a. Explain briefly the Harvard and Von-Neumann CPU architecture. **(06 Marks)**
   b. Sketch the internal block schematic of 8051, list its salient features and briefly explain its register set. **(10 Marks)**
   c. Briefly explain the dual functions of port-3 pins of 8051. **(04 Marks)**

2. a. Briefly explain any four addressing modes of data of 8051 with an example for each. **(06 Marks)**
   b. Explain the operations of the 8051 instructions:
      i) RLC A   ii) DA A   iii) MUL AB and   iv) AJMP addr   **(08 Marks)**
   c. Write an ALP (assembly language program) in 8051 to count the number of positive and negative numbers present in the internal memory block starting with the address 20H, containing N bytes. Store the counts after the last data byte in the memory block. **(06 Marks)**

3. a. Briefly explain the different assembler directives used in an assembly language program. **(04 Marks)**
   b. Write an 8051 ALP to find the value of N!/R! using a subroutine that calculates the factorial of a given number. Assume the values of N and R are stored in locations 10H and 11H. Store the value of N!/R! in 12 H. Assume N!, R! and N!/R! are all maximum 8 bit values. **(10 Marks)**
   c. Write an 8051 software time delay subroutine to generate a time delay of 100 μsec when called. Assume crystal frequency as 12 MHz. Show delay calculations. Do not use timers. **(06 Marks)**

4. a. Interface an LCD display unit to 8051 and write an ALP to display the message 'DONE'. **(10 Marks)**
   b. Interface a stepper motor to 8051 and rotate it by checking the status of a simple toggle switch connected to pin P2.0 as follows:
      i)   If switch is open rotate motor in clock wise direction.
      ii)   If switch is closed rotate motor in counter clockwise direction. **(10 Marks)**

PART – B

5. a. With regard to the interrupts of 8051,
      i)   Give the vector addresses of the interrupts.
      ii)   Briefly explain the procedure of enabling / disabling the entire interrupt system and enabling / disabling of individual interrupts.
      iii)   Indicate the default priority on reset and procedure to alter this default priority. **(06 Marks)**
   b. With regard to timers of 8051,
      i)   Explain briefly the difference between the timer and counter operation modes.
      ii)   Indicate how to start / stop the timer if GATE control is also used.
      iii)   Explain mode – 2 operation. **(06 Marks)**
   c. Write an ALP in 8051 to generate a square wave of frequency 5 kHz on pin P2.7 using Timer-1 in interrupt mode. Assume crystal frequency as 11.0592 MHz. **(08 Marks)**

6 a. i) Explain briefly the asynchronous serial communication format.
  ii) Indicate steps of programming 8051 to transmit a character and receive a character serially. **(09 Marks)**

b. Write a 8051 C program to transmit the character '*' continuously serially in the 8 bit, 1 start bit, 1 stop bit, 2400 baud rate format. Assume the crystal frequency as 11.0592 MHz. **(08 Marks)**

c. What is the advantage of using the chip 8255 with 8051? Indicate the functions of the pins A_0 and A_1 of 8255. **(03 Marks)**

7 a. Explain the architecture of MSP430 with its internal block schematic. **(10 Marks)**
  b. Give the details of memory map of MSP430. **(06 Marks)**
  c. Write a note on clock system of MSP430. **(04 Marks)**

8 a. Write an assembly program to generate a waveform with ON time of 7msec and OFF time of 21 msec on P0.5. Assume XTAL of 11.0592 MHz. Use timer 0. **(12 Marks)**
  b. Explain the bits of SCON register. **(08 Marks)**

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